the corresponding points on the photographs taken with cameras about 30 km. apart can generally be recognized. *An interesting novelty is the successful use of the kinematograph for auroral photography.* As to the results set out in the memoir, the most important appears to be a confirmation of the discovery that the lower limit of the draperies tends to fall at one or other of two somewhat closely defined levels, 100 and 107 km. above sea level, a discovery which must, in the opinion of the authors, almost inevitably lead to the conclusion that a predominant part of the cosmic rays coming from the sun and producing the aurora borealis is made up of two groups of rays, each of which has its own quite definite penetrating power.

The development of auroral photography in the Shetlands, the most promising region of the British Isles for the purpose, will be awaited with great interest.

OCCURRENCE OF OZONE IN THE ATMOSPHERE.

[The Victoria University of Manchester, July 14, 1920.]

[Reprinted from Nature, London, July 22, 1920, p. 645.]

With reference to the lecture of Lord Rayleigh published in *Nature* of July 8 on "The Blue Sky and the Optical Properties of Air," the conflicting results obtained by chemical methods in the estimation of atmospheric ozone are recalled. I beg to direct attention to my paper on "The Occurrence of Ozone in the Upper Atmosphere" (Proc. Roy. Soc., 1914, A, vol. xc, p. 204), in which it is shown that a reagent of potassium iodine solution can be made to provide a basis for the distinction of ozone and oxides of nitrogen at high dilutions and enable the approximate estimation of the former. By this method it is shown that, in accordance with the conclusions of Lord Rayleigh, ozone is present in the upper atmosphere, the amount present at an altitude of 10,000 feet being *of the order of* 5×10^{-6} parts per unit volume. Measurements made with sounding balloons up to altitudes of 20 km. also showed the presence of definite amounts of ozone, but no detectable increase between 4 km. and 20 km. The view was put forward that this amount of ozone must be taken into account in considering the optical properties of the sky.

An extension of these measurements was made with greater precision at the Mosso Laboratory on Monte Rosa at an altitude of 15,000 feet, where an average proportion of about 1×10^{-6} parts per volume of ozone was found.—*J. N. Pring.*

THE RELATIONSHIP BETWEEN CLOUD AND SUNSHINE.[1]

By J. R. SUTTON.

[Abstract reprinted from Nature, London, July 22, 1920, p. 667.]

A brief discussion of the observations of sunshine and cloud made during the 20 years, 1900–1919, at Kimberley. In a general way much sunshine postulates little cloud; but the relation is not intimate, and a sunshine recorder can not be regarded as an automatic device for determining the cloudiness of the sky. August gets the most sunshine and February the most cloud.

ATMOSPHERIC AND TERRESTRIAL RADIATION.

By W. H. DINES.

[Abstracted from Quar. Jour. Roy. Meteorological Soc., 46, 163-173, April, 1920.]

The atmosphere is divided into 10 layers of equal mass, each thus contributing 100 mb. to the pressure near sea level. The radiation emitted by each layer on each side is assumed to be $\eta\sigma T^4$, where T is the absolute temperature, σ Stefan's constant, and η a constant depending upon the humidity, mass, cloudiness, etc., of the layer. The proportion of incident radiation absorbed by a layer is η, $1-\eta$, being transmitted. Then the net radiation absorbed or omitted by any layer as a consequence of the absorption and emission by the earth and the rest of the atmosphere may be calculated. For thirteen widely different assumptions as the values of η and their distribution, corresponding to different vertical distributions of cloudiness, etc., the same general results were obtained: The known mean values of T over England show that all strata up to the 400 mb. level are emitting more radiation than they are abosrbing, those from 400 mb. to 200 mb. are absorbing more than they emit, and those above 200 mb. are again suffering a net loss. Since the mean temperatures are not undergoing a systematic change, the losses and gains must be compensated for. In the lower layers the loss is made up by heating due to latent heat of condensation and to *solar* radiation, mainly through contact with the ground and convection; in the highest layers, probably by direct absorption of solar radiation. The gain in the intermediate layers is balanced by the loss due to forced mixing of different layers by winds, resulting in a tendency to estsblish an adiabatic lapse rate where normally the lapse rate is considerably less than adiabatic.

Equatorial temperature distributions, on the other hand, show that all the strata above 400 mb. are gaining by absorption, probably because of the small amount of emission at the low temperatures existing there. This indicates that these low temperatures are due to dynamic, not to radiational, causes.

This method of computation, devised by L. F. Richardson as a substitute for the complex methods used by Gold in his studies on the stratosphere, gives a value for the total loss of heat by the earth in good agreement with that of Abbot and Fowle.—*E. W. W.*

LONG-RANGE FORECASTING IN JAVA.

By C. BRAAK.

[Reprinted from Nature, London, August 5, 1920, pp. 729–730.]

Publication No. 5, 1919, of the Royal Observatory of Batavia, entitled "Atmospheric variations of short and long duration in the Malay Archipelago and neighboring regions, and the possibility to forecast them," by Dr. C. Braak, embodies the results of a long investigation into the sequence of rainfall in the equatorial regions east of the Indian Ocean. Three kinds of variation are studied: (1) With periods of one or more years up to and including the sun-spot period; (2) secular variations; and (3) with periods less than a month, comparable with Abbot's short-period solar fluctuations. The variations, the period of which is intermediate between (1) and (3) above, are treated as disturbances of (1). Dr. Braak lays much stress on a three-year period, of the persistence of which he gives plausible, though not quite convincing, examples. He classifies three groups of years, of high barometer, low barometer, and transition (from high to low), but naturally finds a proportion of years not strictly true to any of these types. It is scarcely surprising that he finds in general a correlation between barometric pressure and rainfall. For the east monsoon he finds strong positive correlation between high pressure and drought, and weaker between low pressure and excess of rain. For the west monsoon he finds, with

[1] Royal Society of South Africa, Cape Town, May 19.